of the results on that point, as stated by the Parisian observers. It is much to be desired that this problem may soon be resolved; the large classes of young men belonging to our medical schools offer an ample field for this investigation, and the surgeons of our army and navy have also great facilities presented to them for this purpose.

Art. IV.—*Hydrotherapy, or the use of Cold Water for the Prevention and Cure of Disease.* By Sam. Kneeland, Jr., M. D., of Boston.

A Silesian peasant has of late years filled the continent of Europe with the report of his wonderful cures by the use of cold water externally and internally, assisted by pure air, simple diet, and exercise. The medical world has now become quite surfeited with the marvels of hydrotherapy, the twin brother of homœopathy, emigrants both from the land of mystic Germany, which has been so aptly called "la terre des miracles, la patrie des hallucines."

It is difficult to understand the action of water, apart from its temperature; though its therapeutic effect is not due to the mere abstraction, or giving of caloric. At common temperatures water allays thirst, moderates heat, and increases the secretions, and can be made a most valuable auxiliary to medicine, if mankind can be induced to abandon the complicated and the far-fetched, and set their proper value on the simple, ever present, gifts of nature.

What stronger proof can we have of the bodily degeneracy of the human race, than the long lists of *drugs* on which, at the present day, such peculiar stress is laid? In early ages, the simple diseases of man were successfully treated by simple remedies, which nature seemed to indicate, everywhere easily obtained and bountifully supplied. With the progress of civilization diseases became more complex, and seemed to require a corresponding medication; artificial remedies were required for an artificial, unnatural state of the system. Instead of leading man back to the forsaken paths of nature, physicians have preferred the easier plan of ministering to this altered condition by the ingenious and stupendous system of modern therapeutics. Good will have resulted from the short lived creation of Hahnemann, if it has any effect in diminishing the enormous doses in which drugs have been administered; so the vogue which has been recently given to the use of water, and the common principles of hygiene, by the "peasant of Gräfenberg," may do something to simplify the therapeutics of the nineteenth century by a more extended use of nature's gifts.

There is no part of medicine more deserving of careful study, and at the same time more neglected at the present day, than the history of therapeutics. To this neglect may be attributed the frequent revival of old medicines, and their use for a time as new ones, till sad experience, or a casual glance at an old author, has revealed the wolf in sheep's clothing, or an old friend with a new face. We shall, therefore, give a historical sketch of the therapeutic use of water, as briefly as possible, and as complete as the authors we have been able to consult will allow. Besides showing that the moderns have not much improved upon the practice of antiquity in the use of water, this will be interesting in tracing the influence of different medical theories upon the employment of this powerful agent.

Passing over the earliest nations, who all acknowledged by their customs the truth of the expression of Pindar, "ἀριστον μεν ὕδωρ," we will pass at once to the father of medicine (B. C. 460). Hippocrates was well acquainted with the use of water both in health and disease, and has clearly expressed when it is beneficial and when hurtful; see his aphorisms (sects. 5, 17, 18, 20, 21, 23, 24, 25), and his works generally. During the next three centuries cold water was extensively used, especially in fevers. Asclepiades (B. C. 90) was surnamed the "cold bather" from his zeal for cold water; the cure of Augustus Cæsar by Musa is familiar to all.

Celsus (B. C. 60) speaks of its employment in a great variety of diseases. We can only refer to his 1st book, sects. 3, 4, 5, 9; 2d book, sect. 17. In book 3d, sect. 9, there is a curious passage, almost identical with a favourite proceeding of Priessnitz, in which he describes a practice which even then was not new; he says, "Si quidem apud antiquos quoque ante Herophilum et Erasistratum, maximeque post Hippocratem fuit Petro quidam, qui febricitantem hominem ubi acceperat, multis vestimentis operiebat, ut simul calorem ingentem sitimque excitaret. Deinde, ubi paulum remitti cæperat febris, *aquam frigidam* potui dabat; ac si moverat sudorem explicuisse se aegrum judicabat."

Aretæus (A. D. 90) advises cold water in various diseases of the brain. Galen (2d century) made most frequent use of cold water in disease; humoralist as he was, he supposed it to act as a solvent and refrigerant: he is particular to mention the contra-indications; he also says "maxima vera continentum febrium remedia hæc duo sunt, venæsectio et *potio frigida.*" Cælius Aurelianus, Alexander Trallianus, Ætius, and Paulus Ægineta (in the 5th, 6th and 7th centuries), extended its use to a great variety of diseases. It is worthy of remark that its use was mostly confined to acute diseases and burning fevers; it was rarely employed in chronic affections.

The Arabians, notwithstanding the strict language of the Koran, paid little attention to its therapeutic use, being carried away by their zeal for chemical preparations. Still Rhazes and Avicenna, in the 9th and 10th centuries, recommend its use very strongly in fevers.

Passing over the middle ages, Savoranola (in the 15th century), and Paracelsus, and Mercurialis (in the 16th), were great partizans of cold water. Van der Heyden, in 1649, was the first who reduced the practice to a system in his "*Arthritifugum Magnum*," in which he says, there is no better preservative from gout, or anything more efficacious in relieving the pains, than cold water. In the 18th century, Sir John Floyer and Dr. Baynard were warm advocates of cold water; with the former it began to be used in chronic affections. A few years later, Frederic Hoffman published a curious work, "*De Aqua Medicina Universali;*" he supposes water to preserve the body supple, and to prevent an excess of friction in its various parts. Dr. T. Sigismund Hahn, of Silesia, used water in almost every disease; but his most striking success was in an epidemic of typhus which raged in Breslau in 1737; the great majority of those treated by cold ablutions recovered, while those who did not submit to this treatment almost all died. De Moneta, of Warsaw, employed cold water in commencing thoracic inflammation, from a theory that catarrhal affections originate from a sudden transition, from *cold to warm*; he began his experiments on himself, and finally applied the cold water even to the catarrhs of old men and infants.

In Italy, the cold water treatment was carried to a ridiculous extreme. Cyrillo, of Naples, wrote a memoir on the subject which is inserted in the *Philosophical Transactions* (1729–30), to which we refer for many curious details. From the opposition of Vallisnieri it fell into disuse, till Giannini recalled attention to the subject by his work on fevers, (Milan, 1805,) in which he concludes that the most efficient remedy is the cold immersion.

Dr. Currie (*Medical Reports*) speaks highly of the cold affusion in typhus, the exanthemata, &c., paying particular attention to the heat of the patient as indicated by the thermometer. We shall allude to many eminent English and French authors, when treating of particular diseases.

In surgery, water has been used from the earliest antiquity. In military surgery it will ever be the remedy most to be depended on. Baron Percy says, "Sydenham asserted that he would renounce the practice of medicine, if opium was taken away from him. For my part, I would abandon the surgery of armies, if I was forbidden the use of water." He treated complicated fractures by continual irrigation with cold water; yet two eminent French surgeons, years after, disputed the claim of having first applied what had been so successfully practised by him and his predecessors.

Medicine has been but little benefitted by all this accumulated experience, as each one had his peculiar form of administration, according to his theory of disease, or individual preference.

To comprehend the extent to which water may be applied in disease requires a slight digression on physiology.

In the *Revue Médicale* (1826), appeared an article by Pelletan on animal heat, of which we shall give an analysis, as it has a direct bearing on our subject. His object is to show that "organic activity is in proportion to the intensity of the currents of caloric which traverse the organs; and that the rapidity of these currents may be increased by the subtraction of caloric, as well as by its production in excess, provided the internal source be sufficient."

So intimately connected with our idea of life is animal heat, that vitality and vital heat are nearly synonymous. This heat is not to be measured by the thermometer, as many very active animals have a comparatively low temperature; it is the result of the proportion existing between the acquisitions and losses of caloric, these alternations necessarily producing currents through the different organs. An organ may be the seat of currents of caloric independently of its temperature; this he shows by examples from natural philosophy, and particularly by galvanic and electrical phenomena. Our organs are peculiarly sensible to the passage of caloric through them;—from the impression produced by plunging the hand in water, he infers that the internal organs are similarly affected; this impression is not proportioned to the water's temperature, but to the difference between this temperature and that of the hand.

Man is continually the seat of currents of caloric; he has a source of heat in his respiration; he loses heat by contact with external objects, and by perspiration; his circulation carries the heat to every part of his system; his body is heated from within, and cooled from without, giving rise to continual currents whose activity depends on the rapidity of production and transmission. Another cause of these currents is the different temperatures of the arterial and venous blood. The vital phenomena and the organic energy seem to be in proportion to the rapidity of the currents, rather than to the temperature. A warm blooded animal cannot long support immersion, in a liquid of its own temperature, although it have the pulmonary transpiration free as a means of losing heat;—in fever and inflammation the temperature may be little, if at all raised, yet the sources of calorification are increased, transmissions are more rapid, and the losses therefore greater; hence more rapid currents of caloric. These principles will account for many otherwise inexplicable or anomalous vital phenomena; they explain the tonic effect of the cold bath, as the currents are more rapid from within outwards from the momentary cooling of the surface. The apparent contradiction of the sedative effects of cold long applied is explained by the circulation, which keeps up the currents, becoming slower; a great number of affections commonly attributed to a suppression of the transpiration depend, on the contrary, on causes which have rendered it more active, as exposure to a current of air. After rubbing the feet with snow and while the snow is in actual contact, there is a feeling of heat, and redness, (although by the thermometer the temperature is quite low,) from the currents of caloric towards the cooled point—finally many aberrations of animal heat, not accounted for by the thermometer, and hitherto considered independent of the common laws of physics, seem to enter naturally under these laws, if we admit the above theory.

This theory is but another expression of what Liebig has successfully maintained in his "Organic Chemistry applied to Physiology and Pathology."

The necessary conditions of animal life are the assimilation of food, and a continual absorption of oxygen from the atmosphere; and all vital activity arises from the action of oxygen on the elements of the food. According to Lavoisier, an adult receives annually into his system from the atmosphere 746 lbs. of oxygen, which is again given out as carbonic acid and watery vapour, the requisite carbon and hydrogen being supplied by the food; the amount of food required must be in a direct ratio to the amount of oxygen taken into the system by respiration. Says Liebig:—"The mutual action between the elements of the food and the oxygen conveyed by the circulation of the blood to every part of the body is the source of animal heat." "The cooling of the body, by whatever cause it may be produced, increases the amount of food necessary. The mere exposure to the open air, in a carriage or on the deck of a ship, by increasing radiation and vaporization, increases the loss of heat, and compels us to eat more than usual. The same is true of those who are accustomed to drink large quantities of cold water, which is given off at the temperature of the body, 98°.5. It increases the appetite, and persons of weak constitution find it necessary, by continued exercise, to supply to the system the oxygen required to restore the heat abstracted by the cold water." But as there is a more or less rapid change of matter continually going on by two opposite processes, alternate waste and reproduction, this increased appetite implies increased waste, increased rapidity of transformation, or increased vital activity. The abstraction of heat, then, accelerates the change of matter, if there be a full supply of food and oxygen.

If health consists in an equilibrium between the causes of waste (chemical action of oxygen) and those of supply (vital force manifested by a temperature peculiar to each organism), disease must consist in a disturbance of this equilibrium. "A diseased condition once established in any part of the body, cannot be made to disappear by the chemical action of any remedy,"—the only way is to increase the resistance of the vital force. This may be done by the proper use of cold water, "by exalting and accelerating the change of matter." Cold water applied to the surface promotes the union of morbific matters with oxygen, and their expulsion from the body. Continues Liebig:—"Let us now suppose that the heat is abstracted from the whole surface of the body; in this case the whole action of the oxygen will be directed to the skin, and in a short time the change of matter must increase throughout the body. Fat, and all such matters as are capable of combining with oxygen, which is brought to them in larger quantity than usual, will be expelled from the body in the form of oxydized compounds."

The physiological effects of cold water vary according to its temperature, the duration of its application, and the patient's strength.

The thermometric temperature of the water is not a sure criterion. Water at the temperature of the air is sedative to the healthy body; but apply the same to the skin when excited and covered with perspiration, and the effects are the same as would be produced on a natural skin by a more intense cold—the temperature becomes relatively lower: such are also the different effects of a cold drink on a person in health, and on one in a raging fever. The general effect of cold is to diminish the size of bodies; when applied to the surface of the human body it contracts the skin, expels the fluids from the circumference to the centre; it suppresses the cutaneous transpiration, and increases the intestinal and renal secretions, and the pulmonary transpiration. By diminishing the calibre of the peripheral vessels, it drives the blood to the brain, as shown by the fact that in men and animals frozen to death the cerebral vessels are found gorged with blood; in this way have been explained the long sleep and comatose affections of northern countries; and the violent headaches to which, according to Linnæus, the Laplanders are subject.

Cold water applied to the surface, or to the mucous membranes, is a tonic, in the true meaning of that word; it causes a constriction of the fibres, diminishing or effacing the cellular and vascular interstices. As caloric is the most powerful of stimulants, cold is the most powerful sedative; it opposes and depresses vital activity and reaction in the most direct and simple manner, as it causes a suppression, more or less considerable, of the action of vital heat, a condition necessary to the continuance of life. It renders the system less susceptible to the action of stimuli, and finally deadens it completely; it strikes with torpor and inertia the muscular and nervous apparatus; in excess "it destroys life by suspending the phenomena of vital affinity by congelation, as excess of caloric does by combustion."

Cold water when applied suddenly, or for a short time, causes phenomena completely opposite to the anti-vital ones just enumerated. Almost immediately after the painful sensation of concentration is felt, an eccentric movement takes place; the circulation is accelerated; the strength is increased; there is more heat, redness, and turgescence; in a word, a veritable febrile paroxysm. This series of phenomena has been called reaction, and is a manifestation of what, within proper limits, is the "vis medicatrix naturæ."

It may be worthy of notice in this connection, that all sedatives of the circulation are diuretics, and vice versâ; this must be something more than a mere coincidence. The opposite fact is equally striking, viz., that all causes which increase the circulation, calorification, and the cutaneous secretion, diminish the quantity of the urine.

Other physiological considerations will find a more appropriate place when treating of the effects of the different methods of administering water.

We would not make of water a universal remedy as does Priessnitz, but we would place the use of that agent upon a physiological foundation, and show the advantage of combining it in suitable cases with other remedial means.

We call this system "hydrotherapy," as infinitely preferable to "hydropathy," which means nothing, and to "hydrosudopathy," which indicates only one of its principal methods. What is hydrotherapy?—It is to restore the diseased body to a healthy condition by the external and internal use of cold water, with a strict observance of the rules of hygiene. Scoutetten* defines it a "method whose aim is to preserve the health, or aid in its re-establishment, by making use, in a methodical manner, of water, and the principal means of hygiene." Dr. Johnson† says that "when taken with all its adjuncts, it is an *artificial primitive condition* to which the sick man *temporarily* submits himself for a temporary purpose, viz., that of giving nature, assisted by art, a fair opportunity of healing his diseases."

Priessnitz is a humoral pathologist; he believes that the essence of all diseases is an undue accumulation of substances improper for nutrition—that the elimination of these is sufficient to re-establish the harmony of the functions—and that this is best effected by the skin. The skin being his principal outlet for the "bad stuff," as he calls it, his object is to open the pores, and facilitate its exit by the frequent application of cold water; the reaction and derivation caused by this, increases its functions, and favours any critical evacuation. Frequent and copious draughts of water, and sweating in a blanket or wet sheet, set the "bad stuff" in motion towards the skin. Not knowing that internal congestions may be caused by the external application of cold water, he must frequently make fatal mistakes. Dr. Graham‡ says that every death at Graefenberg, which came under his notice, was caused by internal congestion, and not by the disease; and this the most enthusiastic followers of Priessnitz cannot disprove.

We shall describe the methods of applying cold water externally, in the following order: 1. the cold bath, general and partial; 2. the cold bath after sweating—cold affusion; 3. the douche, shower-bath, &c.; 4. the wet sheet and wet compresses; 5. sponging, washing, lotions; 6. ice.

I. THE COLD BATH.—This may be subdivided into the *temperate* and the strictly *cold* bath; the former is purely *hygienic*, the latter is a *thera-*

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* De l'eau, sous le rapport hygiénique et medical. Par H. Scoutetten, M. D. Paris, 1843.

† Hydropathy, by Edward Johnson, M. D. London, 1843.

‡ Graefenberg; or, a true report of the Water Cure. By R. H. Graham, M. D. London, 1844.

peutic agent. The thermometer is not a proper index of the effects of a cold bath, as the sensations produced by water of a certain temperature will vary according to the sensibility of different individuals.

The respiration is much less influenced by the temperature of the bath than the circulation. According to M. Gerdy, (*Sur l'influence du froid*, Paris, 1830,) simple baths from 90° to 94° F., render the excited circulation slower, and restore the pulse to its natural calmness, without reducing it lower;—above and below this point they excite the circulation. Below 90° F., reaction often increases the pulse, while the respiration becomes slower. At ordinary temperatures there is but little reaction, and consequently the good effects of the temperate bath are not owing to this; the mere abstraction of caloric, its immediate effect, gives a tone to the muscles, diminishes the perspiration and the weakness attendant on its excess, and acts as a general tonic.

If the temperate bath did nothing but cleanse the skin, it would be invaluable as a preservative of health. A glance at the elaborate nervous and vascular apparatus and great extent of the skin, must show that it is destined to perform a very important part in the animal economy; and whatever this be, frequent ablution is proper and necessary to promote it. This is universally admitted in the treatment of domestic animals.

The skin is an important assistant organ of respiration; experiments prove that the breath and the cutaneous exhalation are composed of the same elements. Dr. Holland says that a function analogous to respiration is carried on by the skin, and that the quantity of carbon eliminated from the blood may be considerably increased through this channel. Liebig remarks, "from the first moment that the functions of the *lungs* or of the *skin* are interrupted or disturbed, compounds rich in carbon appear in the urine." Another important office of the skin is the absorption of oxygen; "Over the whole surface of the body," says Liebig, "oxygen is absorbed, and combines with all the substances which offer no resistance to it."

Besides its cleansing properties, the temperate bath is useful when the system is oppressed by heat, and the sensation is from the first agreeable, when no natural or morbid secretion is in danger of being suppressed: those subject to pulmonary and rheumatic affections should avoid the second shivering, succeeding the one felt on entering the water. If the bath be taken merely to refresh, exercise and consequent reaction should be avoided. It has been recommended in diseases of irregular nervous action, as hysteria, chorea, epilepsy, &c.—If, as some maintain, Bright's disease may be often traced to interruption of the sensible or insensible perspiration, the temperate bath will be useful in securing the healthy action of the skin.

M. Begin (*Nouveaux Elémens d'Hygiène*, par Ch. Londe, Paris, 1838, tom. ii., p. 449) gives the following account of his sensations on plunging into water between 70° and 60° F., in the middle of October. At the instant of plunging he had a sensation of repulsion of the fluids towards the great cavities; the respiration was panting and rapid; the pulse hard and small,—in two or three minutes the skin became warm, the chest dilated; the pulse became full and strong; muscular action strong and easy,—soon the body became vividly red, with an agreeable sensation of heat; he seemed to swim in water of 100° to 110° F., which offered no resistance to his vigorous strokes,—this state of preternatural vigour lasted about fifteen or twenty minutes, when a chilling sensation was felt; on leaving the water he hardly felt the rough towels with which he wiped himself.

The temperature of the bath should be from 50° to 46° F., and lower if possible; the body soon gets accustomed to this, and reaction does not properly follow unless the temperature be gradually lowered. Reaction is proportioned to the coldness of the water, and (cæteris paribus) is slower in proportion to the strength of the individual; a weak person might die of cold in a bath not cold enough to cause reaction. The weaker the person the colder should be the bath, and the shorter its duration; this rule is not absolute, as the calorific power is not the same in persons of apparently similar strength. In nervous and irritable persons it should be applied at first comparatively warm, and gradually made colder, that the calorific power may be increased in proportion.

It may be well to state the proper manner of taking a *therapeutic* cold bath, i. e., below 50° F. It should be taken on an *empty stomach*, before breakfast or dinner,—the patient should not *feel cold* before using it; if he do, he should take *moderate* exercise enough to remove this sensation, though the circulation and respiration ought not to be hurried at the moment of entering,—after wetting the head and shoulders, to prevent cerebral congestion, the body should be *quickly* and *completely* immersed, including the head, that there may be no partial refrigeration. The maximum duration should be ten minutes; for most persons five will suffice; when very cold two or three minutes should be the maximum,—if longer continued, reaction may not take place at all, and dangerous congestions may ensue; or it may be excessive, and cause grave internal inflammation. Reaction is rendered more speedy and complete by frictions of the various parts of the body,—the *second* shivering, (i. e., after reaction,) should be carefully avoided.

From Dr. Herpin's (*Gazette Médicale*, Paris, March, April, May, 1844) experiments, (in the Arne, in the Canton of Geneva,) it appears that a thermometer placed between the thighs, after immersion and wiping, descended to 77°, and even 72° F., where it remained for about a minute, —he felt cramps from excessive organic and muscular contraction,—the radial pulse was imperceptible, though the beatings of the heart were increased by 8 to 24 pulsations, immediately after leaving the water; in less than five minutes it was normal in frequency, but weak.

According to Dr. Forbes, (*Cyclopedia of Practical Medicine,*) the cold bath (below 88° F.) is used to produce the shock, the refrigeration, and the reaction. The shock is produced by the sudden and short application of water at a low temperature; for example, in a swoon, in hysteric and convulsive diseases—it should be avoided where refrigeration and reaction (which almost always result) would be injurious. The continued application of water at a moderate temperature will cause refrigeration, without shock or reaction; employed in fevers, where the heat is steadily above the natural standard, reaction is in proportion to the coldness of the water, the suddenness and force of its application, and the vigour of the individual.

The cold bath renders the skin less sensible to cold: Edwards has shown that the system can produce more heat in winter than in summer; the daily use of cold water will enable it to do the same, and protect the body against sudden changes, the source of so many catarrhs, rheumatisms, gouty paroxysms, &c. Bruce, the traveler, says that it is an erroneous opinion that the cold bath is strengthening in very warm climates; as, when heated by violent exercise he found himself much more refreshed by the warm bath,—this may be true for persons heated by violent exercise; but the warm bath would only increase the feebleness caused by a too heated atmosphere. Any one may convince himself that the cold bath renders the body capable of greater exertion, by comparing his running or leaping before and after it. M. Trousseau, speaking of the restoration of the cold hands, feet, and skin, of nervous people to the normal temperature by the use of the cold bath, says "at the same time that the skin ceases to be sensible to the action of cold, the viscera cease to suffer sympathetically from this sensation, doubtless because the skin has taken on the habit of a more energetic reaction. Consequently, those who before took cold on the slightest exposure, or experienced a diarrhœa and other accidents, can now brave with impunity the inclemencies of the weather."—(*Traité de Therapeutique*, Paris, 1841. Art. Froid.)

The very cold bath is improper for infants, on account of their extreme sensibility; for the aged the bath should be moderate, and of short duration, on account of the less activity of their calorific powers. It should not be continued in a weak and debilitated patient, if the reaction becomes less each day, lest complete exhaustion or fatal congestion ensue. It is the common opinion that it is safest to go quite *cool* into the water, and that the slightest *heat from exercise* should be carefully avoided. On this point Dr. Currie (*Medical Reports*, London, 1814, pp. 111, 112, 113) remarks: "In the earlier stages of exercise, before profuse perspiration has dissipated the heat, and fatigue debilitated the living power, nothing is more safe, according to my experience, than the cold bath. But nothing is more dangerous than this practice after exercise has produced profuse sweating, and terminated in languor and fatigue. Because, the heat is not only sinking rapidly, but the system parts more easily with that which remains." The cold bath ought generally to be suspended during the menstrual periods.

We shall notice now the principal diseases in which the cold bath has been recommended.

It is particularly useful in nervous affections, in mania, chorea, hysteria, &c.; it diminishes the nervous exaltation, and gives tone to the digestive organs. It is an excellent prophylactic in scrofula; it seems to change, as it were, the lymphatic into the sanguine temperament, increasing the activity of the capillary circulation. There is no better tonic in general debility, uncomplicated with organic lesions. As will be seen hereafter, it is of great advantage in commencing rickets, giving solidity to the bones, and amending the general health. Many fear to apply it in the exanthemata, dreading the retrocession of the eruption; but the *fears of theory* should yield to the *facts of practice.* Giannini strongly urges cold immersion in measles, and says that the eruption goes through its periods with unusual mildness; Guersent maintains the same in scarlatina; Currie has used it in variola, considering it a highly *stimulating* application, and calculated rather to favour, than repel, the eruption. It is of very great service in irregular, insufficient menstrual discharges, complicated or not with chlorosis; in metritis, with or without leucorrhœa; in prolapsus uteri; and in chlorosis, together with martial preparations.

The long continued use of the cold bath is contra-indicated when there are visceral obstructions, or tendency to internal congestions. It should be especially avoided in affections of the heart, which would be much aggravated by the efforts to overcome the resistance of the cutaneous circulation. In fevers, when the heat is steadily above 98° F. with dry skin, it is advantageous; but when there is a tendency to perspiration, or a sense of chilliness, it is of doubtful utility, if not positively injurious.

The principal forms of the *partial* cold bath are the half-bath, the hip-bath, and the foot-bath; the hand, head, and eye-bath will not require special notice.

What is the action of the *partial* application of cold water? here again the views of Liebig come to our assistance. Diseased conditions are often removed by exciting an artificial diseased state, as by a blister or sinapism; "thus diminishing by means of artificial disturbance the resistance offered by the vital force to the external causes of change in these parts,—where this is unavailing, the physician diminishes the number of the carriers of oxygen by bloodletting." By the partial application of cold water, heat is lost, and there is an accelerated change of matter in the *cooled part;* the resistance to the action of oxygen is here the *weakest,* which is equivalent to *increased* resistance in the other parts—"the whole action of the inspired oxygen is exerted on the cooled part." Dr. Johnson (*op cit.*), who has paid considerable attention to this point, remarks: "Now let us suppose an inflammation to exist in some organ in the upper half of the body, in the brain or lungs. In whichever organ it be, in that organ the force of oxygen is predominant over the vital force;" if the lower half of the body be plunged into cold water, and there kept till the "*resistance* offered by the vital force to the force of oxygen becomes *still weaker* than it is in the *diseased part*, the force of oxygen is diverted from the *diseased* part, in order to attack those *other parts* in which it meets the least resistance. Thus by the judicious use of cold water alone, *all the good* effects of blistering and bleeding are most readily and certainly produced without any of the *bad* effects."

The half-bath is employed when the cold bath is beyond the patient's strength, and in order to accustom him to the latter, and as a revulsive and excitant. Between 44° and 50° F., fifteen minutes is the maximum duration; the water should not reach above the umbilicus; its action should be aided by friction; this is a powerful revulsive. If the tub be closed above, and the upper parts of the body be warmly covered, it becomes a powerful excitant, causing a veritable febrile paroxysm. Dr. Currie speaks of its good effect in hemoptysis "by immersing the body up to the pubes in cold water, a practice that I can speak of from experience as often safe and efficacious in this disease." It is also useful in retention and incontinence of urine.

The hip-bath differs from the preceding, in that the lower extremities are not immersed in the water; hence its principal action is on the lower abdominal viscera and the genital organs.

The water (in a wooden tub, for metal is too good a conductor of caloric) should not quite reach the umbilicus; the other parts of the body should be well covered; it should not be used towards night, if nocturnal excitement of the genital organs is to be feared; its duration is fron ten minutes to three hours, according to the desired effect. It is of benefit by its revulsive action in cerebral congestions, aided by cold applications to the head; in various affections of the organs of generation; in sanguineous discharges from the abdominal viscera.

There are three kinds of foot-bath; in the first, the water reaches to the knees; in the second, to the ankles; in the third, the sole only is immersed. The first is used as a revulsive; at a higher temperature to calm inflammatory symptoms, old cutaneous eruptions, ulcers, fistulæ, rheumatic and other pains, are benefitted by remaining in water of 60° to 62° F., for an hour or two. The second, the pediluvium, is also a revulsive or sedative according to its temperature. The third, when the water is very cold, is the most active of all; it causes a painful sensation which can rarely be borne more than five minntes. Pediluvia at a low temperature may be substituted with advantage in cases where the warm foot-bath is generally employed. At a moderate temperature, and long continued, they are much used to prevent inflammation after sprains, &c.; if too cold, reaction would render the inflammation more violent. They are of service in hemorrhage, whether from the thoracic or abdominal viscera. Are they proper in gout? If a gouty foot be plunged into cold water, a most painful sensation is often felt; if reaction takes place, the evil is increased; that *moderate* cold *constantly* applied, *without reaction*, would be useful none will deny, but as there is difficulty in this application, and danger of causing metastasis to the internal organs, it is more prudent, and perhaps quite as effectual, to use the *tepid* bath. As a general rule the cold foot-bath is contra-indicated during the menstrual periods, in copious perspiration, hemorrhoidal and other chronic discharges, and in thoracic inflammations; the exceptions to this rule will be mentioned hereafter.

II. THE COLD BATH AFTER SWEATING.—Completely opposite opinions prevail as to the propriety of this bath. It is said, on the one hand, that to expose the body reeking with perspiration to the action of cold water is the height of rashness; while, on the other hand, it is confidently asserted that it is not only harmless, but advantageous. Both these opinions are founded in truth, but the former is apt to be the opinion of the careless observer, convinced by the frequently fatal consequences of the cold bath, or the ingestion of cold fluids, after violent exercise in midsummer. As these phenomena are foreign to our purpose, we shall not attempt their explanation, nor the similar dangerous effects of cold water applied to the body perspiring from the action of stimulant diaphoretics.

That it is perfectly safe to plunge into cold water when the body is perspiring from mere atmospherical or artificial heat, is proved by the customs of many nations; the Russian, and the North American Indian, plunge into the icy river with impunity, after they have been heated in their rude vapour baths. Priessnitz envelops his patient with blankets and feather beds, instead of putting him in a vapour bath; when the sweat breaks out, fresh air is admitted into the room, and the patient is freely supplied with cold water to drink; after remaining in this state often two or three hours, he is led to the cold bath. If the patient be very irritable, he is first wrapped in a wet sheet and then enveloped as before; the first sensation of cold lasts about ten minutes when the heat of the body changes the cold wet sheet into a universal fomentation, the sheet becomes dry in about an hour, when the perspiration breaks forth.

These are never failing methods of exciting the skin; they are superior to the Russian vapour bath, as they leave quiet the organs of respiration by allowing the patient to breathe the fresh air; avoiding by means of cool air and drinks, cerebral and thoracic congestions. This process renders the skin red and hot from the accumulation of blood; the fluids lost are constantly supplied by cold drinks, a surplus of animal heat is also accumulated, which enables the system the better to endure the cold bath. The sudden immersion in cold water deprives the skin of its excess of caloric, and repels the fluids towards the centre of the body; but soon reaction takes place, and the blood is again brought to the surface, causing a sensation of warmth, increasing the capillary circulation, and giving tone to the muscular and nervous systems.

In order to comprehend the full power of the sudorific process it will be well to say a few words on *perspiration.*

There is continually going on from the surface of the body an exhalation by evaporation, a purely physical process, entirely independent of life; this evaporation requires an atmosphere not saturated with moisture, and is active in proportion to the heat, dryness, and motion of this atmosphere; it persists equally well after death, and continues after the suppression of the real perspiration; it is not of this that we shall here speak. Perspiration, properly so called, is a vital process of secretion, and therefore influenced by the laws of animal life; it takes place either as an invisible vapour, the *insensible* perspiration; or it is condensed into the form of *sweat*, from its abundance or certain external conditions. The true perspiration is secreted by a glandular parenchyma in the dermis in the form of sacs, and is poured on the surface by spiral ducts opening very obliquely under the scales of the epidermis; the "diapnogenous apparatus" of Breschet. The normal amount of this secretion is, according to Lavoisier and Seguin, one pound fourteen ounces in the twenty-four hours; in old age it is somewhat less.

What is the function of these glands? According to the best authorities, "the dissipation, in the form of vapour, of a portion of the watery element of the blood." Why this dissipation of the watery element of the blood? The following is the ingenious explanation of Dr. Willis (*London Medical Gazette*, April, 1844): nutrition and secretion take place by the *transudation* of the nutrient element of the blood through the vessels in every part of the body; this transuded fluid re-enters the circulation by *endosmosis*, which implies the mediate contact of fluids of *different* densities. "This securing of a greater density in the returning current than in the outgoing current of the circulating fluid, I find in the exhaling function of the skin." The natural supposition that the venous blood would be more dense than the arterial blood by the amount of watery fluid lost in the peripheral circulation, is supported by the experiments of Dr. Davy and others, (which show the density of venous blood to be 1·053, of arterial blood 1·050: the density of the serum of venous blood to be 1·026, of arterial blood 1·022); hence, whenever the peripheral circulation is increased, "a greater action of these glands is necessary to secure the return into the venous system of the plasma, or nutrient fluid, which is transuding the capillary arteries in unusual quantity."

It would naturally be supposed that the suppression of a secretion, amounting daily to twenty-four or thirty ounces, would be a powerful cause of disease; and we have a long list of catarrhs, rheumatic affections, fevers, inflammations, effusions into the serous cavities and cellular membrane, &c., as the consequences of its diminution or suppression. M. Fourcault (in a paper read before the French Academy of Sciences, in 1838) has given some interesting experiments, showing the effects of stopping the transpiration by tar, varnish, or glue applied to the skin of animals; when the whole surface was thus excluded from the air, he produced acute inflammations, congestions, and death; when a part only was covered, he caused partial inflammations, chronic irritations, &c.

What are the effects of perspiration on the system? The most evident is a great loss of watery fluid; by the method of Priessnitz this is really enormous. Dr. Hallman (*Archives de Médecine*, March, 1844) has given some experiments showing the amount lost by a patient by this method. A man, æt. 30, was under thet reatment six months; he was enveloped at four A. M. for three hours and three quarters, and at four P. M. for two hours and a half; he was weighed, naked, before and after each process; during them he did not urinate, but drank a known weight of water which must be added to the loss by perspiration in order to obtain the true loss; the experiments were made in August, 1842; the average is taken. In the morning, before the experiment, he weighed 133⅓ Troy lbs.; after it, 131 lbs.; drank 3 oz.; *total* loss about 3 lbs.; in the afternoon, before experiment, he weighed 136 lbs.; after it, 132½ lbs.; drank 5 oz.; *total* loss nearly 4 lbs.; the sum of both about 7 lbs. This must be divided between the skin and the lungs; according to Lavoisier and Seguin 11 parts belong to the skin and 7 to the lungs, then 4⅓ lbs. were lost by the skin, and 2⅔ lbs. by the lungs; this is four times the normal quantity lost in this month. By such a loss of fluids, the body loses a greater amount of carbon and hydrogen, which can only be supplied by a greater amount of food; hence the increased appetite of those under this process, in other words, the change of matter is accelerated, waste and nutrition are increased by this process assisted by cold water, proper food, and exercise; thus the old fluids are gradually supplied by new ones, and the whole organism, as it were, regenerated. It also increases the tendency of morbific matters to combine with oxygen, and facilitates their escape by the skin.

Perspiration is a cooling process, opposing the heating influence of increased arterial action. Dr. Currie remarks, " as in respiration a gas is constantly converted into a solid or fluid, and thus heat evolved, so in perspiration a fluid is continually converted into a vapour, and thus heat is absorbed." The mere flow of perspiration does not cool, there is necessary an antecedent vital act which shall direct the reaction to the surface; thus we see at the end of the hot stage of an intermittent the sensation of heat diminished before the *sweating* stage has fairly commenced, before even a drop of perspiration has made its appearance, and in some intermittents there is no sweating stage.

A very common effect of the sweating process is the appearance of abscesses and furunculi on the surface of the body; this brings us to the so called "*crisis*" of the water cure. By "crisis" we do not mean here the papular, or even pustular cutaneous eruptions which may be caused in any one by exciting the skin by heating applications, by increasing its nutrition by a sudden change in the habits, &c.; this is the *false* crisis, of which we do not speak, though it is probably very frequently the crisis of the water cure.

During the reign of solidism, many were the sneers against the doctrine of crisis and critical days, and such are not uncommon even now.

When disease is left to itself, nature always make an effort to get rid of it; there is a continual struggle between the organism and the morbific matter. The removal of deleterious principles is generally effected by the skin, kidneys, and mucous membranes. In diseases having a "*materies morbi*" to be expelled, if nature get the mastery, the morbific matter is eliminated with the concurrence of certain functional troubles, causing a "*critical disease;*" in the exanthemata, the fever arising from the struggle is a *critical disease.* But this is not exactly a *crisis;* in the course of the same diseases, nature by a last effort, or assisted by art, gets rid of the offending matter by *secondary* phenomena appearing in the above mentioned organs. This uncertain, inconstant, accidental effort, *superadded* to the ordinary process of elimination, is the *crisis.* The *critical disease,* then, and the *crisis,* are different manifestations of the vis medicatrix naturæ, freeing the system from morbific principles. This is the true *Hippocratic crisis,* and does not embrace the phenomena of diseases "*sine materia,*" in which there is no deleterious agent to expel; in many acute diseases, as pneumonia, pleurisy, &c.; in various nervous affections, as hysteria, chorea, &c.; the disease is often terminated by a copious sweat, or salutary hemorrhage; these are not *crises,* but merely accidental depletions, as the same amount of fluids lost by venesection, or a hydragogue cathartic. A crisis shows, in fine, that nature has made an attempt to relieve herself by throwing the action of the morbific agent on the organs of elimination, and is therefore a *consequence* and not a *cause* of a salutary change in the system.

By admitting the existence of *crises,* we do not admit that of *critical days,* founded on the Pythagorean doctrine of the power of numbers; nor does it follow that they invariably appear in certain diseases. In diseases "sine materia," as nervous affections, whenever the vital force is exhausted, or too feeble for the necessary reaction, a crisis does not take place. In acute diseases, where the powers of the system are comparatively strong, crises are most frequently *seen,* but even here, the ordinary activity of the excretory organs is usually sufficient, and the morbific matter causes a *critical disease* and not a *crisis.* Another reason, and the principal one, of the rarity of crises, and the consequent denial of their existence, is well explained by Dr. Copland, who says: "The large depletions and the copious and repeated alvine evacuations very frequently resorted to, often manifestly prevent the accession of regular crises; 1st, by debilitating the patient, and thereby rendering the vital resistance insufficient for their full evolution; and 2d, from the circumstance of these means of cure being substituted or artificial evacuations or crises, and preventing by anticipation and substitution those which are natural."—(*Medical Dictionary,* Article Crises.)

The nature and amount of the critical discharge, the organ by which it is effected, and the accompanying symptoms, depend on the nature of the disease, the constitution of the individual, and the peculiar treatment employed. The sudorific process by daily exciting the skin, and the subsequent reaction from the cold bath, causes the cutaneous surface and the subjacent tissue to be the usual organs by which the critical evacuation takes place. The kidneys and the mucous surfaces are sometimes the channels of elimination; it is important that it should take place by a *non-vital* organ, *i. e.,* by an organ not "intimately and strongly connected with the central vital parts, the stomach, bowels, brain, &c." The perspiration may be critical, varying according to the disease and its previous treatment; the sweat of a gouty patient spreads an acrid odor through the apartment; different drugs are sometimes percéived in the perspiration, especially sulphur; it is probable that the blue, green, and different coloured sweats, of which the journals give some instances, are owing to the expulsion of various medicines,—during the sweating process it is very common to see the coverings variously stained.

Is the fever which precedes the crisis necessary for the "*coction*" of the morbific matter? In the Hippocratic sense, *coction* is synonymous with *digestion,* the morbific matter undergoing a process similar to that of the food; "the difference," says Trousseau, "between the aliment and the morbific matter is that the first, assimilated to the substance of the body, causes only a transient disturbance over which the organism easily triumphs; the other, on the contrary, foreign to the system, revolts and troubles; hence fever. For us, as for the school of Hippocrates, fever is always a condition of the cure of these diseases, the condition *sine quâ non* of the morbific coction."

The sudorific process acts, (as according to Dr. Billing all medicines ought to act,) by causing the relaxed capillaries to contract to their normal dimensions.

As a general rule, the cold bath after sweating is applicable in diseases caused by a chemical or miasmatic matter, *i. e.,* in those having a materies morbi; and principally in chronic affections, also in diseases sine materia, as in those purely nervous. In the former, it facilitates the combination of the morbific matter with oxygen, and its consequent escape from the body; it removes the diseased fluids, and aided by the rules of hygiene, supplies their place with new and healthy ones; in the latter, by the gradual regeneration of the fluids it increases the strength and gives a tone to the nervous system. A most important application is to *medicinal* diseases, or those caused by the excessive use of drugs and mineral poisons, especially to *mercurial* affections.

If, as Dr. Todd (*British and Foreign Medical Review*, Oct., 1843) maintains, rheumatism be caused by an undue accumulation of lactic acid in the blood, this process, by exciting the skin, the principal channel for its elimination, must be highly beneficial.

In the wide class of dropsical affections, due either to diminished action of the absorbents or to increased secretion, this process would, *à priori*, seem indicated. [See a case by M. Baumgarten, in the *Journal des Connaissances Medico-Chirurgicales*, for Jan. 1844.]

It has been used successfully in chorea. Dr. Babington says: "In St. Petersburgh, I am informed by a Russian physician, a new practice has, within the last year, been adopted with eminent success in obstinate cases of chorea. The patient is placed in a bath as hot as he can bear it; kept there for ½ an hour; and, when thus thrown into the most profuse perspiration, is suddenly plunged into cold water—sudden shock—should not hesitate to employ it on the testimony I have received in its favour."—(*Guy's Hospital Reports*, vol. 6, 1841.)

It is most efficacious in persons of a cold, lymphatic temperament; in the sanguineous temperament it must be used with great caution, to avoid the ill effects of an increased circulation without a corresponding increase of the respiration, the blood not being properly oxygenated.

III. Cold Affusion.—Cold affusion is the pouring upon a part, or the whole of the body, of water between 40° and 60° F.; its duration is from two to fifteen minutes—in the partial affusion it is usually upon the head that the water is poured; in the general affusion, it is dashed against the back and shoulders. Dr. Currie used water between 40° and 50° F.; though in the summer he used river water, between 65° and 70°, with about the same effects, if *suddenly* applied. According to him, it may be used at all times of the day " when there is no sense of chilliness present, when the heat of the surface is steadily above what is natural, and when there is no general or profuse perspiration."

Like the cold plunge, the cold affusion is sedative, cooling, and "perturbing" in its immediate action; the consecutive effects depend on the extent of reaction—by its sedative and cooling properties it is very useful in the febrile paroxysm; by its "perturbing" property in the ataxic form of fever, with irregular nervous phenomena; its stimulating powers, from reaction, have been detailed under the head of the cold bath.

It was in the treatment of fever that Dr. Currie, the great advocate of the cold affusion, met with his happiest results,—in the typhus of infirmaries and garrisons. He says, the best time to employ it is at the height of the exacerbation, or immediately after its commencing declination, *i. e.*, between 6 and 9 P. M.; though it may be used at any time under the restrictions above quoted—by it the fever is often checked on the 1st or 2d day, and its course is shortened in other cases. He adds, "Injury has sometimes occurred from continuing the cold affusion in the period of convalescence. Neither is the cold affusion safe after the sweating stage of fever has continued some time, and the body is passing through that cooling process."

Dr. Jackson* remarks, "The affusion of cold water may be made boldly and fearlessly at the commencement of the greater number of fevers, where the subject possesses the proper susceptible condition; it must be made cautiously, and with a careful consideration of circumstances, in the latter periods of most."

The cold affusion diminishes the febrile heat, thirst, and frequent pulse, and induces perspiration and refreshing sleep. In the Reports of the Edinburgh Royal Infirmary, is an account of an epidemic of typhus, in which Dr. Duncan observes, "The direct application of cold to the skin by means of affusion or sponging with cold water and vinegar, was almost universally ordered, and its good effects in reducing morbid temperature, and in alleviating the burning sensations of the patient, were unequivocal; but I have no confidence in its being able to cut short a fever actually begun."

Dr. Currie also employed the cold affusion in the exanthemata, especially in variola.—He says, "in situations where the eruptive fever of small-pox is clearly distinguishable, and where it does not abate sufficiently on the admission of cold air, the affusion of cold water may be resorted to with confidence and safety, regulated, however, in this application as in every other, by the actual state of the patient's heat, and of his sensation of heat."

Mr. Marshall observes, (*Medico-Parochial Researches,*) that the treatment he has found the best in confluent small-pox, is one general blood-letting, ad deliquium, to relieve the congested vessels; afterwards, during the continuance of the febrile heat, the cold affusion. He says; "Believing small-pox and scarlatina, in their first stages, at least, to be analogous diseases, and finding that the cold affusion was justly esteemed orthodox practice in the latter complaint, I deemed myself justified in extending its application to the former, and in no single case have I had cause to repent, or even to stand in doubt of the propriety of having done so."

It has been recommended in the hot stage of intermittents, when the heat is 102°, or even 105° F.; at this heat it does not produce a chilliness. If the thermometric temperature be the guide, the cold affusion might be used, even in the cold stage; as, according to the experiments of M. Gavarret, a thermometer placed in the axilla during the shivering stage of intermittent, always indicated 2, 3, or even 4° above the natural heat.

* History and Cure of Febrile Diseases. London, 1818.

M. Godemar (*Gazette Médicale de Paris*, Nov. 26, 1842) gives six cases illustrating the good effects of the cold affusion in cerebral affections not depending on inflammation or organic lesion; as habitual headache, with perversion of the senses, vivid moral emotions, and stupor; he used it combined with the cold bath.

It is probable, that many cases of pneumonia and pleurisy, said to have been cured by the cold affusion, were rheumatic or neuralgic affections of the thoracic muscles. To the few genuine cases, as to many other miracles of hydrotherapy, it may be said, "In some constitutions, such is the power of the vis vitæ, that nature will cure diseases, not only without proper remedies, but even in despite of improper ones."

From time immemorial it has been used in nervous affections, in tetanus, convulsions, neuralgia, apoplexy and cerebral congestions, stupor from poisoning, mental alienation, and various cutaneous eruptions.

It is of extensive application in surgery; and many ingenious syphons have been invented to secure a continuous flow of water. If, as many maintain, the nervous element be the most important in the development of inflammation, the cold affusion, by its sedative effect on this system, must be a powerful antiphlogistic agent; by hindering the "accumulation of innervation," inflammation does not arise—hence its utility in sprains, fractures, dislocations, lacerated and contused wounds, and after severe operations. Berard (on the therapeutic effects of cold affusion in lacerated wounds) says: "The favourable result is thus explained; every contused wound must suppurate; suppuration cannot be established without a reaction of more or less intensity; and it is in order to restrain this reaction within moderate bounds, to prevent the extension of inflammation to neighbouring parts, that the affusion is to be employed,—it is useless when suppuration is well established." By its promoting reaction, it is of great benefit in old sprains, white swellings, from disease of the soft parts, and commencing spontaneous dislocations—by its constringing property, it is useful in reducible strangulated hernia; in capillary hemorrhages, directly or indirectly applied, as to the back and shoulders in epistaxis, hæmoptisis, &c., to the abdomen and thighs in intestinal and uterine hemorrhage.

The contra-indications are the same as for the cold-bath; where external inflammation exists, and suppuration is well established, it must be used with caution, as it "facilitates induration." In fevers, it should not be used when there is a sense of chilliness, even if the thermometer indicate a preternatural heat of the surface; nor when the heat is less than, or only equal to the natural degree, though the patient should not feel chilly.

IV. The Douche—the Shower Bath.—The douche is one of the most efficacious methods of applying cold water in chronic affections, but one which requires great powers of reaction. It consists of a column of water, from ten to twenty feet high, and between two and four inches in diameter; when employed on the head, it should not be more than $\frac{1}{3}$ of the smallest of the above dimensions; the water falls obliquely, and for five to fifteen minutes; reaction should be facilitated by brisk frictions—it should not be prolonged beyond the second febrile shivering, and should be omitted during a febrile paroxysm.

From what has been already said, it must be evident that the douche is a powerful tonic for those able to bear it; it excites the cutaneous circulation, reaction being increased by the percussion,—it accelerates the change of matter, and increases the action of the absorbents, as is proved by the rapid disappearance of chronic tumours under its influence,—it is often combined with the sweating process.

Dr. Tweedie* says that the cold douche to the head should never be omitted in cerebral inflammation, the scalp having been previously shaved; he observes, "I employ it constantly both in hospital and private practice, and certainly with the most excellent effects. A cold lotion should be constantly applied in the intervals, and on any threatening return of the symptoms, the dash should be immediately employed." For an account of its efficacy see also a paper by Dr. Cahill (in the *Dublin Journal*, for July, 1839) on its use in delirium tremens; in the different forms of mania it is also used with great benefit.

Its chief use is in chronic affections, and nervous diseases (chorea, epilepsy, hysteria)—in chronic leucorrhœa, gonorrhœa, and certain catarrhs without secretion—in passive hemorrhage—in chronic glandular swellings, pains of the articulations not depending on inflammation, in paralysis, in incomplete anchylosis, and in muscular stiffness and atony.

In cerebral affections, it can not be safely used when there is coma and feeble pulse, as life might be at once extinguished by such powerful sedation; for the same reason it should be employed cautiously in weak children and in the aged. It is contra-indicated in acute diseases generally, and in a febrile paroxysm; during the menstrual discharge, hemorrhoidal flux, and active hemorrhages.

There is a form of the douche upon which Dr. Macartney lays much stress in the treatment of inflammation; it is what the French call "*douche à irrigation continue.*" It consists of a vessel of cold water, in which is placed a syphon; the free extremity of this is very small, and allows only a small stream to fall upon the affected part, (usually covered with a compress)—the apparatus must be watched, that the stream may be *continuous.* Dr. Macartney "places the limb in a trough, covers it with lint, and then conducts the water from a contiguous vessel by means of a broad strip of woollen cloth, acting as a syphon, which is to be inserted in the vessel of water, and is to terminate in a point when it touches the lint." This prevents, or moderates inflammation by diminishing the size of the arteries, reducing the sensibility, and hindering the "accumulation of innervation;" the field of its application is immense.

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* Clinical Illustrations of Fever. London, 1830.

The shower bath is familiar to every one; but there is one form, often called the "Scotch douche," which is not much known. In this the shower is alternately cold and warm, causing rapid changes in the cutaneous circulation without much shock; it is used when reaction is feeble, as a preparative for the cold douche.

The ordinary shower bath is usually a mere hygienic means, being one of the least disagreeable methods of applying cold water. It causes a greater shock than the cold bath, without the painful sense of constriction from immersion in a dense medium. It is perhaps the best preservative against the colds and rheumatisms so common to many persons on the slightest exposure, by accustoming them to sudden changes of temperature —it is of benefit between the paroxysms of some forms of asthma. Nothing is better for children and adults of a scrofulous habit than its daily use, gradually progressing from tepid to cold, provided there is no internal disease.

As a therapeutic agent it may be used in nervous diseases; in cerebral affections, with the warm foot bath; in headaches from any excess, &c. It is best taken immediately after rising in the morning.

V. The Wet Sheet—Wet Compresses.—The process of envelopment in the wet sheet has been already alluded to, (p. 87;) the first sensation of cold is soon succeeded by a pleasant warmth. It produces two *directly opposite* effects according to the manner and duration of its application—if changed as often as it becomes warm, it is a powerful refrigerant and sedative; if it be continued unchanged for an hour, it produces a sensation of warmth, and copious perspiration, acting like a warm fomentation to the whole body. In fevers, by the first method, it diminishes heat and thirst, facilitates eruptions, and provokes a refreshing perspiration, renewed on the approach of each febrile paroxysm. The application, by the second method, instead of producing *cold*, is a sure and safe way of producing *warmth;* and thus its use even in certain thoracic and abdominal inflammations may not be so unreasonable as many suppose.

Wet compresses are also of two kinds, *cooling* and *heating;* they act on a part of the body as the wet sheet acts on the whole. The cooling compresses, when *properly* applied, are antiphlogistic; but as they are usually applied they are worse than useless,—the usual way is to dip a rag in cold water, apply it to the part, and let it remain till it gets dry,—before this takes place the heat of the surface increases; the shock on each renewal causes a reaction, and increases the inflammation. Their application should be *continued,* and the best way to secure this *continued* low temperature, is by some apparatus like the one of Dr. Macartney mentioned above,—they should not be *abruptly* discontinued, when the inflammation is subdued. They are prompt resolutives in superficial inflammations, and will often prevent suppuration in deep-seated tissues.

The *heating* compresses should be wrung out of cold water, but not so tightly that they will dry too soon,—they should be covered with *dry* compresses, to avoid rapid evaporation. They are excellent emollient applications, and answer all the indications of a cataplasm; they are much superior to this last, that they cost nothing, undergo no chemical alteration offensive and irritating, do not oppress by their weight, are less liable to become cold, and are more easily reapplied.

They may be used in most local chronic diseases,—in gout, rheumatism, diseases of bone, ulcers, abscesses; they calm pain better than ointments and plasters, and without irritation.

There is one form of the wet compress which is much used by the followers of Priessnitz, the "abdominal cincture." It consists of a piece of linen about a yard wide, folded in three, about 2½ yards long; half of this is wrung out of cold water and applied to the abdomen; the dry portion of the band should cover this. They use it in almost every chronic abdominal affection—in constipation, in meteorism, colics, visceral congestions, and in affections of the digestive organs.

VI. Cold Ablution.—Ice.—From its greater convenience, cold ablution will be much more frequently used as a therapeutic agent, than the cold or shower-bath. The evils attendant on a neglect of cleanliness have been mentioned; the extreme sensibility of the skin; the most powerful predisposing cause of catarrhs and rheumatisms is removed by the daily sponging of the body with cold water immediately after rising.

In febrile diseases, there is nothing more effectual in diminishing the heat of the skin than the cold ablution. Under Dr. Currie's restrictions the cold *affusion* is perfectly safe; but, as Dr. Elliotson observes: "In general, I do not find the heat steadily above 98°; I do not find patients free from a certain degree of chilliness; and I, therefore, content myself with tepid or cold ablution. I have never had occasion for affusion, but it is always safe, under the restrictions I have laid down. The cold-bath is too chilling a thing; it would strike too suddenly. But when it would not be safe to take a patient out of bed, and throw cold water upon him, you may always have recourse to ablution, either cold or tepid."—*Principles and Practice of Medicine*, London, 1842. In eruptive fevers, and especially in the small-pox, it is used almost universally among semi-civilized nations. In affections of the integuments and mucous surfaces accompanied by great heat, the relief afforded by it is instantaneous; as in burns, herpetic affections of the mucous outlets causing intense and obstinate pruritus.

Ice, according to the duration of its application, is a sedative, excitant, tonic, astringent, and resolutive.

Frictions with ice or snow are universally employed to restore gradually the circulation in frozen parts; by virtue of the same exciting property, it is used as a revulsive to restrain uterine and other hemorrhage, frequently repeated, and for a few moments at a time; it excites contractility in the distended parts in strangulated hernia, and at the same time diminishes the volume of the contained matters. By its astringent properties it is useful in inflammation and hemorrhage, by diminishing the calibre of the vessels; it may be applied even to the bleeding vessels of the uterus, and may be swallowed in hæmatemesis and hæmoptisis. By its sedative power it is the antiphlogistic "par excellence," in inflammation, after venesection, or when this last is impracticable; in cerebral affections, in traumatic inflammation, and wherever the cause is not internal; the application in this case should be *continued* till inflammation be subdued, of course taking care not to freeze the parts.

As cases showing its effects in subduing inflammation, and also serving as the types of a large class of diseases, we may mention a case of phlebitis after venesection detailed in the *Gazette des Hôpitaux*, of Paris (Nov. 23d, 1841); and a severe inflammation of the tonsils, related by Dr. Gumprecht in the same journal (for Oct. 3d, 1843). The application of ice formed an important part of the celebrated method of Valsalva for the cure of aneurism; an interesting case of a cure of aneurism of the crural, and end of the external iliac arteries is given in the *Gazette Médicale de Paris* (Sept. 10th, 1841).

The internal administration of cold water will be considered under the two heads of drinking, and injections.

I. THE DRINKING OF COLD WATER.—Nothing is so well calculated to allay thirst as cold water; it supplies the fluids lost by the various secretions; by its "universal solving power," it assists digestion; it promotes the elimination of morbific matters by the perspiration and urine, both of which it *naturally* increases; it calms the nervous system, and is an elegant universal tonic. According to its temperature, it has a sedative or exciting effect upon the stomach; of moderate temperature, it calms and refreshes; very cold, it excites reaction, and its consequent increased afflux of blood, secretion, and absorption. It is a most powerful diaphoretic and diuretic; if the surface be kept warm, it will cause profuse perspiration; if the surface be kept cool, it will cause diuresis. According to Dr. Graham, for the first three or four days after drinking largely of cold water, the urine is "limpid, colourless, highly stimulating, inodorous, and apparently without urea;" as if the kidneys, having as much as they could do to relieve the system of this surplus of water, were not able to separate the urea; after a time the system gets accustomed to it, and the water is in part carried off by the skin and lungs.

Water is strictly digestible, and furnishes to the system a certain supply of oxygen and hydrogen. Dr. Pereira (*Elements of Materia Medica and Therapeutics*) says that cold water "is a vital stimulus, and more essential to our existence than aliment," that it "serves at least two important purposes in the animal economy; it repairs the loss of the aqueous parts of the blood, caused by the action of the secreting and exhaling organs;

and it is a solvent of various alimentary substances, and therefore assists the stomach in the act of digestion, though, *if taken in very large quantities, it may have an opposite effect*, by diluting the gastric juice."

No precise rules can be given as to the quantity of water to be taken. As a general rule, not more than ten or twelve tumblerfuls should be taken daily; these should not be taken rapidly, one after the other, as too much caloric would be abstracted from the internal organs; nor should much be taken during a repast, for the reason just quoted from Pereira; the quantity may be gradually increased, care being taken to prevent the weakness from copious perspiration by the cold bath, proper food, and exercise; it is better supported in summer than in winter, for obvious reasons. When the body is perspiring from mere external heat, much cold water may be taken with safety; the numerous deaths from this cause during our hot summers show the danger when the body is heated by violent exercise.

What are the dangers of water drinking? M. Guerard read a paper before the Academy of Medicine, of Paris (Jan. 25th, 1842), in which he concludes that the fatal effects of cold liquids on the stomach, when the body is sweating, depend on the following causes (in the order of gravity): 1st, the previous heating of the body; 2d, the emptiness of the stomach at the time of taking them; 3d, the quantity swallowed; 4th, its low temperature, and that its effects are more *vital* than *physical.*

It is not from the mere internal use of water that the most important therapeutic effects are to be expected; this must be seconded by proper food, exercise in the open air, and regular habits. It is not uncommon for persons thus benefited, to discontinue their exercise and regular habits, and at the same time to continue to drink largely of cold water; the consequence is, that "the functions of the skin and mucous membrane become partly suppressed, and the water, penetrating into the cellular tissue instead of being carried off, remains there located, constituting the disease of dropsy or anasarca."

The use of cold drinks in fevers has had its advocates and opponents according to the prevailing medical theories. "On the whole," says Dr. Currie, "it may be asserted that the use of cold drink in fever is contrary to modern practice (1814), and that where it is occasionally given, it is administered with caution, and rather permitted than enjoined." He made his experiments, thermometer in hand, and has given the following rules: it is not to be used in the *cold* stage, however urgent the thirst; when the *hot* stage is fairly formed, it may be given freely, with the effect of diminishing the heat of the surface, and inducing perspiration and sleep; and "the more freely in proportion as the heat is farther advanced above the natural standard;" it should be cautiously used at the commencement of the *sweating* stage. After the perspiration has become "general and profuse, the use of cold drink is strictly to be forbidden," for reasons mentioned under the head of cold affusion. Dr. Dewees (*Practice of Physic*, p. 78) says, "From the well conducted and conclusive experiments of Dr. Alexander, it appears that the heat of the body can transcend the 'sweating point,' and that, when this is the case, it requires a reduction of temperature before the sweating process can commence. He fixes this point at 108°, but we have reason to believe this too high, say 100° or 102°. Hence it is that a drink of *cold* water has many times proved the best diaphoretic, by suddenly bringing down, or reducing the heat of the body to the 'sweating point;' and that by sponging the body with cold water or vinegar, perspiration has been immediately excited. It may, therefore, be laid down as a rule, that all attempts to procure perspiration will be unavailing, if the heat of the body exceed 102°."

In the exanthemata it is almost sure to bring on perspiration, and the speedy appearance of the eruption; and, according to Dr. Hancock, their course is singularly abridged. Professor Schönlein, of Berlin, asserts that nothing is better calculated to facilitate the eruption of small-pox, than to drink much cool water in small swallows.

From the testimony of physicians in hot climates, cold drinks are of great utility in affections of the gastro-intestinal mucous membrane—in acute and chronic gastritis, accompanied with intense thirst; by their immediate action on the walls of the stomach, in obstinate vomiting, gastralgia; in enteralgia, and certain cases of cholera. Copious draughts of water are useful in many inflammatory affections of the urinary organs; the salts of the urine, being dissolved in a greater quantity of water, are less stimulating to the mucous surfaces.

In the *Medical Magazine* (Boston, 1833) there is a paper by Dr. Shute, recommending cold drinks in cholera; he was led to this treatment by the analogy between the stage of collapse in cholera, and the impaired vital energy resultiug from starvation or excessive cold; and his principle of treatment is, "that the greater the sinking of the vital powers, the greater is the necessity of withdrawing all kinds of stimulus,"—for details we must refer to the journal.

As a preservative against the effects of cold, it is far preferable to alcoholic stimulants; Napoleon's Russian campaign will sufficiently prove this. It is second only to the cold bath, in removing inordinate sensibility to cold—in the accidents attending imperfect digestion, a draught of cold water is almost specific.

There is a rare disease, mercurial palsy, which obstinately resists the best directed treatment, which is treated by Piorry in the following simple manner:—he causes the patient to drink copiously of cold water, even to three gallons daily; with long-continued baths accompanied by friction—under this treatment one case recovered in forty-eight hours, and four others in from three to five days; they had baffled all previous attempts at cure; they remained two or three weeks in the hospital after their cure without a relapse in any case. This will not appear inexplicable after what has been said of the power of water to accelerate the change of matter, and to cause the expulsion of morbific principles.

The contra-indications are few, and easily recognized. The lymphatic temperament; extreme youth and age (from the facility of refrigeration); are contra-indications to its employment in its full extent—also, diseases of the bladder with retention of urine; chronic dropsies; catarrhal affections, &c.

II. Injections.—Under this head will be mentioned enemata, injections into the different cavities, and into the circulation.

Enemata of cold water are comparatively little used. At first, the temperature should be from 55° to 60° F.; in the course of a few days it may be reduced to 45°, 40°, and even lower—in intense inflammations and hemorrhages, icy injections may be used—at first, they should not be retained more than two or three minutes; as the intestine becomes accustomed to the sensation of cold, they may be retained even to their complete absorption.

The affections in which these are peculiarly efficacious ,are, habitual costiveness, diarrhœa from atony of the intestines, and cholera—in dysentery, used every half hour they diminish the pain and tenesmus, but are not to be relied on to the exclusion of other remedies—in the various symptoms of hysteria, as spasms, colics, palpitations, flatulence, &c., nothing will sooner break up the paroxysm than the cold enema, and cold external applications—in intestinal hemorrhage from the lower portions—as a revulsive, very cold, in hemorrhage of the pelvic viscera.

The principal cavities into which cold water is injected, are the bladder and the uterus.

For injections into the bladder, a catheter with a double channel is the most convenient—they are peculiarly useful in vesical hemorrhage and chronic mucous discharges—as an instance of its utility in the former, we may cite a case from the *Gazette des Hôpitaux* (Paris, 1838); a bleeding which threatened to be fatal, was checked by the injection of ℥vj of iced water into the bladder, thrice repeated, allowed to remain five minutes each time.

It is useless to cite cases of the employment of cold and icy injections into the uterus, in hemorrhage from atony or inertia of this organ.

Cold injections are also frequently made into the urethra, vagina, the ears, the nostrils, the lachrymal sac, and fistulous ulcers—in the first, they are used to check bleeding, or to remove and diminish excessive discharges—in the last, at a low temperature, they act as stimulants.

From the experiments of Magendie and others, it appears, that when water is injected into the veins after venesection, so that, with the same bulk of fluid the blood is rendered more watery, "the affections and instincts are changed; from being noisy and uncontrollable, an animal becomes tranquil." Magendie has prolonged the life of a hydrophobic patient for seven days, by injecting water (about 3½ quarts) into his veins; from horrible agony the patient became perfectly calm—[death usually occurs in forty-eight hours, in great agony.]

We shall not speak separately of the principal hygienic agents, (pure air, exercise and diet,) as this would lead us too far from our subject; we shall only allude to one, *diet*, as *compelling* the absorption and elimination of morbid products and principles. A rigorous diet, by furnishing an inadequate supply of carbon for combination with the oxygen taken in by the lungs, compels this surplus oxygen to combine with whatever has the strongest affinity for it; this will always be found to be either morbid products in disease, or in health, the matters the least essential to life,—this is proved by the unnatural secretions, for a short time, of such as are submitted to a rigorous diet.

Let us now show the practical application of the foregoing principles to the treatment of particular diseases, by reference to the best authors.

FEVERS.—We have already seen the utility of cold applications, both external and internal, in simple fevers; it remains to say a few words on such applications in the exanthemata.

Water will not remove the proximate cause of disease, nor will drugs; the powers of the organism are alone competent to this,—it can only act by placing the system in the conditions the most favourable for the full manifestation of its curative powers.

The two principal dangers in the exanthemata, are the violence of the eruptive fever, and the retarded appearance or retrocession of the eruption; both of these are benefited by cold water. The eruptive fever being a critical effort of nature to free herself from a morbid principle, any attempt to suppress it entirely, must be dangerous. In ordinary cases of the exanthemata, cold applications should be made with caution, and with more in some than in others—in measles, scarlet fever, and simple erysipelas, (in which the eruption is erythematic and superficial,) retrocession is much more readily produced by cold water, than in small-pox (the eruption of which is deeper-seated and pustular); hence the method of Sydenham, so beneficial in this last, would be dangerous in the former. The object of cold water, then, is not to extinguish the fever, but to keep it within *natural* limits, and to moderate internal inflammation by exciting the reaction of the skin,—if this internal inflammation be too violent for the proper manifestation of the cutaneous symptoms, the internal use of water, and the wet sheet, will diminish the one, and excite the other; if the cutaneous inflammation be too violent, cold or tepid sponging will happily reduce it.

Measles so rarely surpasses the natural standard, that their use must be limited in the treatment. The Germans have especially extolled cold water as a remedy in the grave forms of scarlet fever; particularly Frölich, of Vienna,—he made the thermometer his guide; the greater the heat of the body, the lower the temperature of the water; at 98°, 100°, 104°, and 107°, he used respectively water at 90°, 75°, 60°, 40°, with which he washed the patient all over,—when the heat is very high, he prefers the cold bath and ablutions,—he has never known the eruption to recede.

Dr. Currie mentions that the cold bath and cold affusions have long been used in small-pox, by the Chinese and the Eastern nations: from his great experience he says, "This, however, I can declare, that in all the cases in which I have used the affusion of cold water during the eruptive fever, however severe the symptoms may have been, these symptoms instantly abated, and the disease assumed a benignant form."

Spasmodic and Nervous Affections.—The key to the treatment of these diseases is in the following aphorism of Hippocrates (Sect. 2, 26): "Febrem convulsioni supervenire melius est, quam convulsionem febri:" in other words "fever resolves spasm."

There is a perpetual antagonism between the powers of assimilation and nutrition, or the vegetative functions, and the functions of relation, (as of sensation and motion,) or the nervous system,—whence it results that the poorer and feebler the functions of nutrition, the more irregular and disordered are the phenomena of the nervous system; and, on the contrary, the more active and energetic the former, the more regular and orderly are the acts of the latter. When the body, then, is suffering under fever or inflammation, (which essentially belong to the vegetative functions,) few nervous phenomena are observed—as says Hippocrates, if febrile phenomena supervene in a patient suffering under a nervous or spasmodic affection, the disorderly acts of the nervous system are restored to order; on the other hand, if symptoms essentially spasmodic supervene upon a febrile disease, the fever ceases, though frequently with great danger to life—the best preservative, then, against nervous diseases must be the natural equilibrium between these grand systems. If a *pathological* febrile condition be so powerful an antagonist to nervous affections, it would be naturally supposed that a *physiological artificial* fever would be equally efficacious —that this is the case we hope to show by a few examples.

We have already seen that the application of cold water, externally and internally, aided by the rules of hygiene, is a most natural and powerful means of exciting an *artificial physiological* fever.

To mention a few examples—and first of *tetanus*, which is so often beyond all the resources of medicine; enormous doses of opium have been given, even 120 grains in a day, without the least benefit. A physician of Montreal, according to Trousseau, has combined opium with cold affusions —he submits his patient to the cold affusion, till a kind of syncope comes on; he then envelops him in dry, warm woollens, giving a vinous potion containing a large dose of opium. Dr. Currie, following the example of

Dr. Wright, met with the greatest success in idiopathic tetanus, from the cold immersion.

The famous case of the soldier, George Gardner, (in his 13th chapter,) is well worthy of mention; this man took large quantities of opium, which only relieved the spasm as they brought on paralysis; small doses of camphor, with wine, were afterwards substituted; the symptoms returned with increased violence, when it was determined to try the cold bath. He was carried to the salt water baths, and thrown headlong into the water at 36° F., (in March)—the good effects were immediate; and after successive plunges for a minute longer, the muscles gradually relaxed,—when taken out, the pulse and respiration were quite suspended, and the only sign of life was a general tremor. He was briskly rubbed, and warmly enveloped; the pulse and respiration became regular; the heat returned, and he fell asleep,—the convulsive hiccup only returned, which yielded to the daily use of the bath for a fortnight. He relates a second case of success from the same treatment. He did not meet with success in traumatic tetanus, though his experience was not extensive; the experience of Dr. Wright encourages its use even in this kind of tetanus.

Other convulsive diseases are benefited by a similar treatment, as chorea, epilepsy, hysteria—for a case of chorea of nine years standing, in which there was general paralysis and greatly diminished intelligence, cured by the cold bath, see the "*Bulletin de Therapeutique*," (April 1834.)

As long ago as Hippocrates, it was known that convulsions were cut short by an intermittent fever; in the Aphorisms, Sect. 5. 70, we read: "A quartanis correpti, a convulsione non admodum corripiuntur; si verò prius corripiuntur, et postea quartana supervenerit, liberantur."

Dr. Selode, of Brussels, (*Gazette des Hôpitaux, Paris*, Jan. 16, 1845,) having reflected that the appearance of an intermittent fever in an epileptic had sometimes the effect of modifying the convulsive affection, by causing a different pathological state, had the idea of producing artificial periodic paroxysms against similar attacks. He mentions two cases, in which this artificial fever put an end to the epileptic attacks. An intermittent fever may be *imitated*, as Rostan noticed some years ago,—the *cold* stage may be simulated by the cold bath, from an hour to two hours,—the *hot* stage may be also imitated by covering the patient warmly in bed, in a warm air; the heat becomes very great, and copious *perspiration*, or the 3d stage follows. This inversion of the sudorific process, persevered in for several days, (producing daily a new access,) will finally cause the febrile phenomena, as it were by *habit*, without recourse to the above means.

Dr. Currie mentions a case of obstinate spasmodic stricture of the neck of the bladder, in which not a drop of urine had passed for thirty hours, which was instantly relieved "by placing the patient's feet on a marble slab, and dashing cold water over the thighs and legs." The conclusion which he draws from the use of the cold bath for fourteen years in convulsive diseases is, that the benefit derived from it depends on its being used *during the paroxysm;* that it thus resolves or abates the paroxysm, and retards, or entirely prevents its return.

Cerebral affections.—In cerebral congestions, we have already mentioned cold applications to the head, assisted by previous depletion and revulsive irritation. The following case of M. Récamier (*Gazette des Hôpitaux*, March 12, 1842) shows the utility of cold water in meningitis; the disease had lasted a week, and presented the following symptoms: small and frequent pulse, burning heat of skin, dry and black tongue; almost constant delirium, especially at night; spasmodic, painful contraction of the muscles of the neck; retention of urine. A tumblerful of cold water (50 F.) was ordered every fifteen minutes, with quarter enemata at the same temperature. His object was to excite a movement of reaction towards the skin,—when this took place, the "heating compresses" were applied to the contracted muscles,—the symptoms rapidly abated. In the March and May numbers of the same journal for 1842, he gives several cases of delirium, from various causes, successfully treated by the cold affusion,—among others, a chronic delirium, or commencing mental alienation; the delirium so common as a sequel of meningitis, after the inflammatory symptoms have disappeared; that depending on some unknown modification of the innervation; and that produced by the abuse of alcoholic drinks,—he concludes that the cold affusion may be employed with confidence, when the cerebral affection is without fever, or with a very slight one; when there are no longer symptoms of congestion; and even in those depending on a material lesion, if proper treatment have previously reduced their intensity. In furious insanity, a sudden plunge in the cold bath is almost a specific remedy.

In the stupor arising from certain poisons, as the narcotic drugs, carbonic acid gas, alcohol, &c., a sudden dash of cold water acts with a "voltaic energy, sending a thrill through every nerve"—but, in the "poisoning" by alcohol, it is of the most frequent utility; the drunkard is best roused from his "apoplectic slumbers" by cold water; "thus the heat is reduced, the orifices of the skin opened, sensible perspiration is produced, and one half of the mischief of intoxication is prevented."

There is no organ the seat of more functional and organic troubles, capable of being prevented or relieved by the use of cold water, than the uterus. This organ, from being the seat of a *monthly* congestion, very frequently becomes *permanently* congested, with the usual accompaniments of hypertrophy, displacement, and chronic irritations; leucorrhœa, amenorrhœa, sterility, and functional hysteric troubles. The cold bath will remedy or prevent this, by causing a more equal distribution of nervous influence, by exciting cutaneous reaction, and diminishing the primary uterine congestion.

In cutaneous affections, M. Biett says, that simple baths are especially useful in the dry, squamous forms; that their efficacy is less remarkable in the papulous forms, though they relieve the itching of certain lichens; that in the vesicular forms they are only useful when the inflammation has begun to subside; that in the impetiginous forms they may be used when the pustule has been succeeded by a crust,—the shower-bath at 75° F., he has found advantageous in general squamous affections, in which the skin seems to be almost insensible.

MM. Devergie and Gibert have made more recent experiments with the "sudorific process," in chronic cutaneous diseases, at the Hospital of St. Louis, Paris; viz., by sweating, cold immersion, and a proper regimen. It is expressly stated, (*Gazette des Hôpitaux*, Sept. 24, 1842,) that the cases submitted to this treatment were either such as are considered incurable, or had been already submitted to various other remedies without relief,—the cases were mostly the squamous forms. M. Devergie says, "that hydrotherapy has cured, but the cure has been often followed by relapses; that, in general, it has ameliorated the cutaneous affection; that it has evidently ameliorated the health, except in one case."

It is an old and well-founded opinion, that it is dangerous to treat gout by the prolonged use of cold water; the disease leaves the surface and attacks the internal organs, which, being less sensitive, the patient supposes himself cured.

The two indications in gout are, to subdue local inflammation, and to expel the morbific matter from the system.

The first is well effected by cold applications,—these should be strictly *local*, and should be discontinued when the effect has been obtained. Dr. Graham speaks from experience of their efficacy in relieving the *pain* of gout; he took four hundred drops of laudanum in one night without the least effect, the pain protecting the system against the narcotic influence—he infers, "that the sedative effects of cold very much surpass those of opium, or, perhaps, of any other known remedy." If a gouty articulation be submitted to the cold *douche*, the pain is soon relieved; but a vivid redness supervenes, with great heat and itching—in some cases, resolution of the tumour takes place by increased absorption; in others, violent inflammation ensues, with suppuration and loss of the joint.

The profuse ingurgitations of cold water, as practised at Gräfenberg, can hardly assist in expelling the gouty matter from the system; the urine is increased in *quantity*, but not the amount of *urea* excreted, (some combination of which constitutes gouty matter)—the kidneys have enough to do to free the system from the excess of water; hence, it is probable, that even a *less* amount of urea is excreted. The gouty matter, repelled into the system by *cold*, should be eliminated from the body by the natural outlet, the kidneys; this can only be effected by rigid *abstinence* and *disuse* of watery drinks,—a copious sediment soon appears in the urine, which disappears with the disease.

Dr. Bostock (*London Medical Gazette*, Feb. 1844) gives a case of gout cured by a complete course of "hydropathization;" says he: "Mechanical and unscientific as the idea may appear, I confess I am disposed to attribute a considerable effect to the complete removal of all the offensive matter which had polluted the vessels, thus thoroughly rinsing them out, and leaving them in a clear state to receive a supply of more healthy fluids."

Dr. Todd, in an article before alluded to, in which he maintains that the cause of rheumatism is an undue accumulation of lactic acid in the blood, (for the elimination of which, the skin is the natural outlet,) says: "We are much inclined to believe, from evidence which has recently come before us, that too much attention cannot be given to promoting the action of the skin, in both the acute and chronic forms of this disease." Every day's experience shows, that to produce a *critical* sweat, is a proper indication in rheumatism; but, on the other hand, we often see long-continued, provoked perspiration, not only not relieving, but actually rendering the disease worse—are not these provoked, unnatural sweats, the efforts of nature to relieve herself from irritating *drugs?* At any rate, the "sudorific process," exciting a *natural* perspiration, must be far superior to an *artificial, irritative, medicinal* sweat.

Is the mercurial treatment the best in syphilis? At any rate, it is the most prompt and agreeable, though it cannot be denied that syphilis can efficiently be cured without mercury. Dr. Graham (*op. cit.*) remarks, that a great proportion of the patients he saw at Gräfenberg were affected with some form of syphilis. A curious, and almost constant phenomenon during the "sudorific" treatment of syphilis which had been for the time cured by mercury, was the *reappearance* of the syphilitic accidents; this had been often noticed at mineral springs, and yet the fact was not explained. Do not these (numerous) facts throw some light upon the action of mercury in syphilis, and upon that of other specific remedies? It would seem that mercury enters into some mysterious combination with the syphilitic poison, forming as it were an *innocuous neutral salt;* which combination being destroyed by the solvent power of water, the mercury is carried out of the system, leaving the free virus to recommence its ravages. Too great quantities of mercury are generally given in syphilis; this causes mercurial diseases worse than the original syphilis; these are mistaken for the phenomena of syphilis, and new doses are given, till the patient is actually poisoned. It is in these cases, in which mercury has been given in excess, that the purifying and alterative powers of water are especially useful.

What has been said of the abuse of mercury, will apply to diseases produced by an excess of other specifics, as iodine, arsenic, antimony, quinine, &c.; and the vast range of diseases which the French call "*cacochymie medicale.*" Hydrotherapy will be found equally useful in the diseases arising from emanations from lead, copper, brass, and mercury in various trades.

Dr. Black, one of the claimants of the anatomical theory of pain in neuralgia, says (*London Lancet*, 1844), "the affected nerves, being contained in rigid canals, must be subjected to injurious pressure, whenever their accompanying vessels are unusually distended with blood." If, as he supposes, the neuralgic paroxysms depend upon this pressure, cold applications should be beneficial by diminishing the quantity of blood in the vessels, and consequently the pressure.

From the experiments of M. Fourcault, showing that albuminuria is an invariable consequence of a suppression of the cutaneous functions; and, before him, of Mr. Ross, (*Lancet*, 1842–3,) who says, "when the natural office of the skin is much impeded, there will be a determination of albumen to the kidneys, and this principle will be occasionally excreted by these organs in its undecomposed state," we may gather some useful hints for the prevention, and perhaps for the cure, of albuminuria. Bright's disease is most commonly observed in cold damp climates, and in those professions exposed to cold and wet, or in those in whom the cutaneous functions are liable to be interrupted; hence, the securing of the free action of the skin, and rendering it less sensible to changes of temperature, by the hygienic employment of cold water, are the most simple and efficient preventives of this affection. From the success of Dover's powder in the hands of English practitioners, we might naturally expect much more from the "sudorific process."

We trust we have thus given a sufficiently full account of the different methods of using cold water for the prevention and cure of disease, their principal indications and contra-indications. We have endeavored to keep within the strict line of recorded facts, and to interpret these in accordance with the acknowledged laws of physiology and pathology. At any rate, all will allow that cold water may be made a powerful *auxiliary* to medicine; but from its very power, it becomes a dangerous weapon in the hands of the ignorant and unprincipled. Moreover, were it ten times more powerful than it really is, and administered with a perfect knowledge of its properties and the laws of the human system, it could never be raised to the honour which Priessnitz and his followers would give it, the absurd title of a UNIVERSAL REMEDY.